Claim Rejections – 35 U.S.C. §103

Claims 1-5, 7-13, 15-19, 21-28, and 43-56 have been rejected as being unpatentable over U.S. Patent No. 6,872,322 (Chow) in view of U.S. Patent No. 6,566,270 (Liu) and Silicon Processing for the VLSI Era (Wolf). Applicant requests withdrawal of this rejection because Chow does not describe or suggest cleaning a chamber including placing a second substrate that is not to form a semiconductor device in a chamber (as recited in claims 1, 15, and 43) or placing a dummy substrate in a chamber (as recited in claims 8, 22, and 50).

Chow relates to cleaning methods that use gases functioning for both etching and cleaning. See Chow at abstract. Chow explains that multiple stages are used to "etch multiple layers on the substrate, and the cleaning gas is introduced in at least one of the stages to remove etchant residue deposited on the chamber surfaces in one or more of the multiple etching steps." See Chow at col. 10, line 35 to col. 11, line 48 and Fig. 3. Thus, in Chow, a single substrate (which forms the semiconductor device) remains in the chamber during the cleaning stage and there is no suggestion that cleaning of the chamber includes placing a dummy or second substrate in the chamber.

Liu and Wolf do not remedy the failure of Chow to describe or suggest this subject matter. Wolf is silent regarding cleaning of a chamber. Liu's described cleaning process occurs after the only substrate that is mentioned is removed from the chamber prior to cleaning and cleaning does not include placement of a dummy or a second substrate in the chamber. See Liu at abstract and Fig. 3.

Moreover, one of ordinary skill in the art would not have been motivated to modify Chow to include the placement of a second or dummy substrate in the chamber for cleaning. In particular, Chow explicitly teaches away from such a second or dummy substrate and explains that increased cost is associated with additional substrates "that results from the downtime of the etching chamber during the dry or wet cleaning and seasoning process steps" (see Chow at col. 2, lines 31-34) and that the "chamber surfaces are cleaned and conditioned by the etchant and cleaning gas combination, without requiring a separate seasoning or conditioning process step (see Chow at col. 11, lines 40-48)."

Accordingly, claims 1, 8, 15, 22, 43, and 50 are allowable over any proper combination of Chow, Liu, and Wolf. The dependent claims are allowable for at least the reasons that the independent claims are allowable.

Claims 6, 14, 20, and 29-35 have been rejected as being unpatentable over Chow in view of U.S. Patent No. 5,756,400 (Ye), Liu, and Wolf. Applicant requests withdrawal of this rejection for the following reasons.

Claims 6, 14, and 20 depend, respectively, from claims 1, 8, and 15. As discussed above, Chow does not describe or suggest cleaning a chamber including placing a second substrate that is not to form a semiconductor device in a chamber (as recited in claims 1 and 15) or placing a dummy substrate in a chamber (as recited in claim 8). Ye, which is cited as showing the use of a chlorine containing gas to remove BOx from the chamber surface, does not remedy the failure of Chow. Accordingly, claims 1, 8, and 15 and dependent claims 6, 14, and 20, are allowable over any proper combination of Chow, Ye, Liu, and Wolf.

Applicant requests withdrawal of the rejection of claim 29 because, as discussed above, Chow does not describe or suggest placing a second substrate that is not to form a semiconductor device in a chamber, as recited in claim 29, because neither Ye, Liu, nor Wolf remedy the failure of Chow to describe or suggest this subject matter, and because one of ordinary skill in the art would not have been motivated to modify Chow to provide for placement of a second substrate in the chamber. Accordingly, claim 29 and dependent claims 30-35 are allowable over any proper combination of Chow, Ye, Liu, and Wolf.

Claims 36-41 and 64-70 have been rejected as being unpatentable over U.S. Patent No. 6,352,081 (Lu) in view of Chow, Liu, and Wolf. Applicant requests withdrawal of this rejection for the following reasons.

Lu fails to describe or suggest cleaning a chamber including placing a dummy substrate in the chamber, as recited in claim 36. In Lu, a substrate 225 is placed in a processing chamber 102 but there is no suggestion that the cleaning step includes placing a dummy substrate in the processing chamber 102. For the additional reasons discussed above, any proper combination of Lu, Chow, Liu, and Wolf would still fail to describe or suggest cleaning a chamber including

placing a dummy substrate in the chamber. Accordingly, claim 36 and dependent claims 37-41 are allowable over Lu, Chow, Liu, and Wolf.

Applicant requests withdrawal of the rejection of claim 64 because neither Lu, Chow, Liu, Wolf, nor any proper combination of the four describes or suggests manufacturing a first semiconductor device including performing a first plasma etching using a first etching gas in a chamber; cleaning the chamber, with the cleaning including replacing the first etching gas with a cleaning gas; and manufacturing a second semiconductor device including performing a second plasma etching using a second etching gas in the chamber.

As the Examiner agrees, Lu does not describe or suggest manufacturing of the second semiconductor device in a cleaned chamber using a second etching gas. Additionally, in Chow, the etching gas in the chamber is not replaced with a cleaning gas and there is no description that a second semiconductor device is manufactured in a cleaned chamber using a second etching gas. Liu and Wolf do not remedy the failure of Lu to describe or suggest manufacturing of a second semiconductor device in a cleaned chamber using a second etching gas.

Applicant also notes that claim 64 does not recite "generating plasma from the Cl_2 … before etching with SF_6 a gas that is inhibited from generating BOx," as the Examiner appears to suggest at Section 14 of the action.

For at least these reasons, claims 64 and its dependent claims are allowable over any proper combination of Lu, Chow, Liu, and Wolf.

Claims 57-63 have been rejected as being unpatentable over Chow in view of Lu, Liu, and Wolf. Applicant requests withdrawal of this rejection because, as discussed above, neither Lu, Chow, Liu, Wolf nor any proper combination of the references describes or suggests manufacturing a first semiconductor device including performing a first plasma etching using a first etching gas in a chamber; cleaning the chamber, with the cleaning including replacing the first etching gas with a cleaning gas; and manufacturing a second semiconductor device including performing a second plasma etching using a second etching gas in the chamber, as recited in claim 57. Accordingly, claim 57 and dependent claims 58-63 are allowable over Chow, Lu, Liu, and Wolf.

Claims 71-84 have been rejected as being unpatentable over Lu in view of U.S. Patent No. 6,842,658 (Izawa) in view of Chow and Wolf. Applicant requests withdrawal of this rejection because neither Lu, Izawa, Chow, Wolf, nor any proper combination of the four describes or suggests manufacturing a first semiconductor device comprising performing a first plasma etching using a first etching gas in a chamber; cleaning the chamber, with the cleaning including replacing the first etching gas with a cleaning gas; and manufacturing a second semiconductor device comprising performing a second plasma etching using a second etching gas in the chamber, as recited in claims 71 and 78. As discussed above, Lu does not describe or suggest manufacturing of a second semiconductor device in a cleaned chamber with a second etching gas in the chamber, and Chow and Wolf do not remedy the failure of Lu to describe or suggest this subject matter. Moreover, Izawa, which is cited as showing the application of a dielectric magnetic field, does not remedy the failure of Lu to describe or suggest the subject matter of claims 71 and 78.

Accordingly, claims 71 and 78 and their dependent claims are allowable over any proper combination of Lu, Izawa, Chow, and Wolf.

Claims 42, 49, 56, 62, and 69 have been rejected as being unpatentable over Lu in view of Izawa, Ye, and Wolf. Applicant requests reconsideration and withdrawal of this rejection because Ye, which was cited as showing cleaning of an inner surface of a chamber with chlorine gas to remove BOx, does not remedy the failure of Lu, Izawa, and Wolf to describe or suggest the subject matter of claims 36, 43 and 50 (from which claims 42, 49, and 56 depend, respectively), or the failure of Lu, Izawa, and Wolf to describe or suggest the subject matter of claims 57 and 64 (from which claims 62 and 69 depend, respectively).